PERFORATION OF THE BOWEL IN TYPHOID FEVER

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By

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INTRODUCTION

Under the title Perforation of the Bowel in Typhoid Fever, after dealing briefly with the history of the operative treatment of this condition and the etiology generally of the complication, I propose to discuss more fully the causation, the symptoms in connection with, the diagnosis of and the treatment by surgical measures of this, the commonest and most fatal complication of enteric fever.

I have selected this subject for my thesis, because in my opinion it is one of great and increasing importance in medicine and surgery and one which has only in recent years found its way into the literature of this and other countries.

During my residence in hospitals under the Metropolitan Asylums Board, I have had opportunities of seeing several cases in the course of which this complication has occurred and of closely watching the different phases of the illness from the moment of the first sign of perforation until the completion of the operation which gives practically the only chance of life.

I have collected notes of twenty cases of perforation of the bowel treated by operation in the North-Eastern Fever Hospital, London, nineteen of which occurred during the years 1901 - 1904, and one during the present year.

I shall give a short account of these cases, followed by a discussion on their salient points, showing how they compare with similar records of other observers.

I am conscious that the notes of the cases may be considered brief and lacking in detail, but I have purposely eliminated from the very full bed-side notes all the matter not directly bearing on the main subject of this thesis, thinking as I do, that details as to the number of hours of sleep obtained, the precise number and character of the stools passed and

similar records would prove tedious.

For the same reason I have not included the temperature charts of my cases but where the temperature has shewn decided changes during the anxious period when the question of operation is being weighed, I have made reference to it.

A consideration other than the fear of proving tedious has, I must confess, also influenced me in writing less on a subject that I have found profoundly engrossing than,without it, I should have done and that is the consideration of the time at my disposal.

During the years 1903/04, I collected material and had done much towards the completion of a paper on the subject of another of the infectious diseases and it was only towards the latter end of last year that one of my colleagues at the North Eastern Hospital, Dr. W. Gordon Pugh, suggested to me of what much greater importance and interest a paper on the subject of perforation in Typhoid fever would prove, than one on the subject I had originally selected.

The fact that I was not at this time in charge of enteric wards influenced me only inasmuch as I was unable to combine my routine work in the wards with the writing of a paper, which has been done in my not too many spare moments, for I have had the opportunity of

seeing and examining all the cases of perforation, and I was present at all the operations with one exception, during the year 1904.

To Dr. Cuff, the Medical Superintendent of the North Eastern Hospital, I am much indebted for permission to use the records of the Hospital. I have endeavoured in each case to verify references, made in papers from which I quote, to other works.

HISTORY

The history of the operative treatment for perforation in typhoid fever is a brief one: the first operation was performed only just twenty-one years ago. It was Layden[1], who first suggested the rational treatment for typhoidal perforation in 1884 and on 7th April of that year, Miculicz[2] first performed the operation. The case on which he operated was not definitely diagnosed as typhoid fever.

Lucke[3] in 1885 was the first to operate on a case definitely diagnosed as one of perforation in enteric fever.

Since that date, year by year the operation has become of greater frequency and collections of records by various authors have, from time to time, been made showing the results obtained in large numbers of opera-

tions performed by different surgeons.

Platt[4] in his interesting articles groups Keen's[5] collection with his own and adding three cases of operation performed by himself gives an analysis of the results. More recently Harte and Ashurst[6] analysed 362 cases collected from the literature of the subject, and the former in an earlier paper[7] gives the following interesting, instructive and encouraging table showing in periods of five years the results of surgical interference in perforation in typhoid fever.

Date	No. of operations	Recovered	Died	Mortality	
1884-1888	10	1	9	90.0	per cent
1889-1893	16	2	14	87.5	" "
1894-1898	110	28	82	74.5	" "
1899-1903	146	45	101	69.1	" "

OCCURRENCE

The conclusion arrived at from a study of the figures of the above named and other investigators, is, that perforation occurs in 2 to 3 per cent of all cases of enteric fever.

In the article by Harte and Ashurst[8] appears a tabulated list of the number of cases in which perfor-

ation was found to have taken place in a very large number of post mortem records; and this I append:-

Authority	No. of cases examined	No. of cases in which perforation was found	Percentage of perforations
Leibermeister	2000	26	1.3
Murchison	1580	48	3.03
Griesinger	118	14	11.01
Flint	73	2	2.7
Curcshmann	829	22	2.7
Montreal General Hospital Post-mortem Records	932	34	3.66
Episcopal Hospital Post-mortem Records	1556	34	2.18
Pennsylvania Hospital Post-mortem Records	1793	45	2.5

In considering the proportion of cases per hundred in which perforation occurs it should be borne in mind that many cases in which death results from peritonitis following perforation are not so certified, the cause of death being often certified as merely "Typhoid Fever". The table given above contains only cases where post-mortem examination has proved the ex-

istence of perforation. The difficulties of diagnosis, the impossibility of keeping certain cases under continuous observation, e.g. in the private practice of many competent men, to which may be added a want of precision in others, all contribute to the conclusions to which I have certainly been brought, that perforation occurs with greater frequency than the carefully compiled records of the post-mortem room would lead us to suppose.

SEX

Perforation undoubtedly occurs more frequently in the male sex than in the female.

Harte and Ashurst[9] give, in 311 cases, 250 men and 60 women.

Of Goodall's[10] series of 96 cases occurring in the Eastern Metropolitan Asylums Board Hospital at Homerton, 62 were males and 34 females.

In the 50 cases operated on for Perforation of the bowel in all the Metropolitan Asylums Boards Hospitals[11] during the years 1901 - 1904, 40 men and 10 women were affected.

The greater incidence of perforation in the male is to some extent accounted for by the more frequent

existence of typhoid fever in the male than in the female, but it is worthy of consideration whether the type of breathing in the male sex and the greater strength of the muscles brought into action during defoecation and other acts calling for exertion, in conjunction with the possession of a less roomy pelvis and abdomen, may not contribute, in some measure at all events, towards precipitating the rupture of an ulcer.

Goodall's[12] figures lend support to this idea: he had eight cases in children, no fewer than seven of which occurred in girls, but in so small a number of cases no conclusion should be drawn and I find that in those cases operated on during the years 1901-1904 in the Metropolitan Asylums Board Hospitals in which the age was 12 years or under there were five males and three females and in Elsberg's[13] cases there were 18 of the male and only 6 of the female sex.

AGE

Perforation may occur at any age but it is naturally more frequent in those of an age in which enteric fever is more common.

Perforation rarely supervenes in the aged. It

is usual between the ages of 10 and 30 years, but no hard and fast rule obtains and perforation may complicate any case of enteric fever.

RACE, CLIMATE AND TYPE OF FEVER

Race and Climate have no bearing in the incidence of perforation. It is more frequent in the autumn months, for it is then that usually typhoid fever is most prevalent and a virulent epidemic may reasonably be allowed to claim more victims from perforation than one of milder type, inasmuch as perforation is more liable to occur during severe types of the disease.

STAGE OF DISEASE

Perforation in the majority of cases takes place during the third week of the disease, that is, at the time when the sloughs are separating from the ulcers.

Harte and Ashurst[14] in a series of 286 cases found only 2 per cent. occurring in the first week, in 56.6 per cent., or considerably more than half, perforation took place in the second or third weeks of the disease.

Goodall[15] gives in 82 cases only five in which

perforation occurred before the third week.

Fitz[16] also, in his 167 cases, found perforation took place in the second, third and fourth weeks, but chiefly in the third.

Platt[17] gives the following table in connection with this question showing the period of perforation in 76 cases:-

Perforation in course of	1st week	No. of cases 3
" " " "	2nd week	" " " 16
" " " "	3rd "	" " " 33
" " " "	4th "	" " " 5
" " " "	5th "	" " " 5
" " " "	6th "	" " " 1
" " " "	7th "	" " " 2
" During convalescence		" " " 3
" a Relapse		" " " 6
" convalescence from a relapse		" " " 2

The period, as shewn by the Metropolitan Asylums Board Hospital's cases, would point to the fourth and fifth weeks as claiming a large number of perforations. Of the 50 cases, the following table shews the numbers occurring in each week.

Perforation during the 1st week No. of cases 0

Perforation during the	2nd	week	No. of cases		4
" "	3rd	"	"	"	16
" "	4th	"	"	"	11
" "	5th	"	"	"	10
" "	6th	"	"	"	2
" "	7th	"	"	"	1
" " relapse			"	"	6

The dangerous period may be looked dn, then, as being chiefly from the beginning of the third until the middle of the fifth week, and hence it is during this time that special vigilance should always be exercised.

PATHOLOGY

Into the pathology of perforation I do not propose to enter fully. Perforation results in all cases from an extention of the ulcerative process to and through the peritoneal coat of the gut.

That inflamatory, adhesions to neighbouring coils of bowel and to the abdominal walls prevent the outpouring of the contents of the intestines into the abdominal cavity is abundantly proved by post-mortem examination.

It is almost equally evident that the rupture is in some cases hastened, if not actually brought about, by certain movements and methods of treatment, in many cases unavoidable, in some avoidable, of which I shall frequently speak.

THE SITE of perforation is in a preponderating majority of cases in the ileum, immediately adjacent to the caecum; this is a natural circumstance, the last part of the ileum being the site, usually of the most, and the more serious ulcers. It is also a fortunate circumstance for though difficulties not infrequently arise in locating the perforation operation may be approached with the reasonable hope that no great difficulty will be encountered in this particular stage of the operation.

Perforation may, and does, occur in other parts of the intestines; the caecum, the colon, rarely except in its ascending portion, the vermiform appendix and the rectum may, any of them, be involved but, according to Harte and Ashurst,[18] 73 per cent. of perforations are found in the small bowel within twelve ins. from the caecum.

The perforation is in the great majority of cases single.

CAUSATION

The causes of perforation may be divided into the predisposing and the exciting. Amongst the former, the influence of age and sex on the incidence of perforation has been discussed.

While remembering that extention of the process of ulceration is the real cause of perforation, the following are given as predisposing causes.

PREDISPOSING CAUSES

(a) THE TYPE OF THE DISEASE

There is a concensus of opinion that severe cases of enteric fever furnish a majority of the cases of perforation and, as the severity of an attack depends in large measure on the number of ulcers and the extent of bowel surface involved, that this should be so is natural. Goodall[19] mentions, in dealing with this subject, that in 20 per cent. of his cases haemorrhage occurred.

(b) THE STAGE OF DISEASE

Perforation though occurring in all stages of the attack, is almost always, as has been pointed out, associated with the acute stage.

(c) TYMPANY

The occurrence of distention may very reasonably

be reckoned a predisposing cause of perforation and no one who has practised, post-mortem, distention of bowel the seat of typhoid ulcers and carefully examined the ulcers by transmitted light, can doubt that, stretched, as in some cases they must be to their utmost limit, the ulcers are in a condition more liable to give way than if their bases were corrugated and lax.

2. EXCITING CAUSES

The exciting causes of perforation may be numerous. Many of them are unavoidable. Almost all of them are associated with movements of the bowels themselves, either in peristaltic action or in pressure brought to bear on them by muscular contractions exerted voluntarily or involuntarily on the part of the patient himself or produced by the unskilled hands of attendants.

The following comprise most of the possible exciting causes of perforation.

(a) ERRORS IN DIET

Errors in diet act as factors in the production of perforation, not only by their mechanical effect but also by inducing disorders of digestion leading to gas formation and tympany.

(b) PURGATION

None but mild purgatives should be prescribed in typhoid fever and the possibility of the rupture of an ulcer through the administration of drugs of this nature should always be borne in mind in prescribing them; the probable resultant good should be balanced against the damage that at any rate, may be caused. Drastic purgatives of any kind are quite inadmissable.

(c) ENEMATA

Enemata are less liable to cause perforation than purgatives, but in the acute stages of the disease their use is not unattended by danger and in my series of cases administration of an enema would appear to have precipitated, if not actually caused, perforation in more than one case.

(d) SUDDEN MOVEMENTS ON THE PART OF THE PATIENT

Avoidance of this contributary cause of perforation is often impossible when delirium is present. In the absence of delirium, careful instruction as to the wisdom of abstaining from all unnecessary movement and of conducting necessary movement with care and deliberation will do something towards the avoidance of danger from this source.

(e) CARELESS HANDLING OF THE PATIENT BY ATTENDANTS

This applies not only to careless and rough movements executed by the nurse, but also to injudicious manipulations on the part of the medical attendant and in this connection I would urge very gentle palpation in an endeavour to elicit gurgling in the right iliac fossa, a sympton of enteric fever, inconclusive and of quite minor importance.

(f) STRAINING AT STOOL

Inasmuch as straining at stool is in part a reflex action, it is unavoidable, but the administration of a caution against the employment of undue exertion during the act of defoecation may act as a deterrent against this cause as a factor in the production of perforation.

(g) MECHANICAL SHOCK

It is worthy of consideration whether sudden shock in producing reflex contraction of the abdominal muscles and the diagphragm may not cause dangerous diminution in the capacity of the abdomen. The shock of immersion into cold water might be avoided by the primary use of water of such a temperature as will not cause shock.

The examining hands should never be cold.

SYMPTOMS

Of American authors Taylor[20] recognises three sets of symptoms, the Pre-perforative, Early or Immediate symptoms, and the Late symptoms, namely those of septic peritonitis.

This division of the symptoms might be of use, were the pre-perforative stage recognisable, but I know of no sign, subjective or objective, giving the smallest indication that perforation is about to occur. The lack of any warning whatsoever of its imminence is one of the characteristics of the complication.

The symptoms have been divided into the local and constitutional. I prefer to classify them into those recognisable by the patient and those discernable by the physician and in enumerating the symptoms of perforation I shall endeavour to give them as far as I am able in their order of importance.

1. SUBJECTIVE SYMPTOMS OF PERFORATION

(a) PAIN

This is usually the first symptom of perforation as it is unquestionably the most important and the most constant.

The seat of pain is variable. Most frequently it is present in the lower part of the abdomen, when

it is usually towards the right side, but it may be felt in any region, the umbilical, not infrequently, the epigastric less often, over the lower ribs occasionally and very rarely pain may be referred to the point of the penis.

Of more importance than the actual seat are the suddenness of onset and the enduring character of the pain.

Pain, beginning suddenly and lasting for upwards of a quarter of an hour, is a signal of grave danger.

The character of the pain is variable; a patient may describe it as cutting or sharp, dull or aching, and indeed it has no special character of its own.

(b) RIGOR

This is an important and frequent sign of perforation. It is occasionally the first symptom. The character of the rigor varies: at times, little more than a feeling of cold with slight shivering; at other times it more closely resembles the character of the rigor seen during the cold stage of a severe attack of ague.

(c) VOMITING

Vomiting per se cannot be regarded as a symptom of perforation. The intolerance of the stomach for

food during an attack of typhoid fever is often one of the difficulties to be met in the treatment of a case. But vomiting, especially if it is a new symptom and if it occurs in conjunction with pain, should be looked on with suspicion and may be allowed to carry weight in arriving at a diagnosis.

(d) SWEATING

This is not a constant symptom of perforation. It occurs independently of a rise or fall in the temperature. Sweating occurring with the first symptoms is due to the shock of the abdominal pain.

(e) CHANGE IN THE ACTION OF THE BOWELS

Profuse diarrhoea may cease or, conversely, constipation may be succeeded by the passage of loose stools. This of course is a frequent occurrence in an uncomplicated case of enteric fever and is only of importance as a warning of possible danger.

2. OBJECTIVE SYMPTOMS OF PERFORATION

(a) RIGIDITY

This is perhaps the most important objective sign of perforation. It is not necessarily a new feature of the illness, but if present, as it often is, prior to the time of the suspected perforation, with perforation it is almost constantly increased. The amount

of rigidity varies; it is generally found affecting the right rectus and oblique muscles but it may, and frequently does, affect the whole of the abdominal muscles and when once it is established, it seldom diminishes and practically never disappears.

(b) INCREASE OF THE PULSE RATE

Of the general, as distinguished from the local symptoms of perforation, this is of great importance. It is an early symptom. Careful watch kept over the pulse rate in the presence of suspicious signs of perforation is of much help in diagnosis. I have seen no case in which the pulse rate has not progressively increased when a perforation, which of course always causes some peritonitis, existed.

In making observation of the pulse excitement, and emotion on the part of the patient, who probably feels that his condition is grave, should as far as possible be allayed. The pulse count should not be made immediately the bedside is reached.

(c) TENDERNESS

Tenderness is frequently present throughout an attack of typhoid fever, but when it is a new feature, when it is increased by pressure and especially when it is most marked over the area of pain, then it may be reckoned as a probable result of perforation.

(d) CHANGE IN THE EXPRESSION

The change in the expression in cases of perforation is important. It may be present quite early. Though often plainly present, it is difficult to describe. It is something like what one would expect to find in an early stage in the production of the facies Hipocraticus. For its recognition a knowledge of the normal features of the patient under observation is necessary and this a careful observer possesses. Sometimes the change is seen in little more than a slight increase in the depth of the vertical depression in the middle of the forehead produced by a frown The blue, anxious, pinched expression comes later and is then of comparatively little importance, as marked signs of peritonitis will probably now be established.

(e) DULLNESS IN THE FLANKS

This may be due to fluid in the bowel, but dullness occurring suddenly and shifting with a change of position is a not unimportant sign as an aid to diagnosis; it is one, however, which may be entirely absent.

(f) DIMINUTION IN THE PERCUSSION DULLNESS OF THE LIVER

The liver dullness may be replaced early, or it may on the contrary, remain unaffected.

This symptom and the last are referred to by Harte and Ashurst[21] as "interesting signs" but I think they are more than that. A very small amount of free gas in the abdominal cavity is, I am convinced often anough to change the percussion note over the liver.

Gentle movement of the patient on to the left side with the shoulders slightly raised, during the mapping out of the liver dulness will often displace gas and, in the anterior axillary line perhaps a note of absolute dulness may be replaced by one of tympanitic resonance.

This method should always be resorted to in looking for this sign of perforation.

(g) ALTERATION IN THE CONTOUR OF THE ABDOMEN

In routine work in hospitals the measurement of the circumference of the abdomen at the level of the unbilicus, is as a rule, taken daily, but the size of the abdomen gives little aid to diagnosis. In perhaps a majority of cases of perforation the girth is increased when tympanitis is present, but more than this cannot be said.

(h) ALTERATION IN THE TEMPERATURE

A drop in the temperature on the occurrence of perforation occurs sometimes, but it is usually quick-

ly followed by an elevation with the onset of peritonitis and frequently the temperature is unaffected.

(i) COLLAPSE

Sudden collapse may constitute a very early symptom, coming on apparently at the moment of perforation and proving quickly fatal, but this is quite exceptional and the immediate shock and collapse, induced by perforation are usually recovered from in large measure. In those cases proving rapidly fatal from this cause, one would expect to find a diseased state of the valves or muscle of the heart.

(k) DELIRIUM

This has been described as an occasional symptom of perforation, but it can hardly be regarded as more than accidental, unless perhaps the shock induced by perforation precipitates delirium in a patient already in a state verging on unconsciousness.

(l) OEDEMA OF THE ABDOMINAL WALL

This is of such rare occurrence as to be almost valueless as a diagnostic symptom of perforation.

(m) INCREASE OF NUMBER OF LEUCOCYTES IN THE BLOOD

Ostler[22] lays stress on a steadily rising leucocyte count. The present methods of blood examination are too tedious to encourage the hope that blood counts will go far to aid in the diagnosis of perforation.

DIAGNOSIS

A careful study of the symptoms enumerated above, will, in a case known to be one of typhoid fever, be helpful towards a diagnosis of perforation.

If the illness is recognised as enteric fever, the difficulties of diagnosis are greatly reduced; it is important, therefore, to determine as early as possible whether a given case of illness is typhoid or not and with this in view, when any symptoms presenting features of typhoid are present Widal's reaction should be employed.

From HAEMORRHAGE, in which collapse occurs with quickened pulse and drawn features, the diagnosis can usually be made from the absence of pain and rigidity; there may have been previous haemorrhages and extensive bleeding is generally quickly followed by the appearance of the blood.

In APPENDICITIS there is rarely the amount of collapse that would be present after a few hours in perforation; the history will help; vomiting with the initial pain is more frequent in appendicitis and tumour can often be made out.

PERITONITIS, the result of pelvic or ovarian dis-

ease may be diagnosed by the history and from bi-manual examination.

CHOLECYSTITIS, which sometimes occurs with typhoid fever is recognisable by the seat of pain being in the right hypochondrium, the possible presence of jaundice, the comparatively little shock, the position of the tenderness and rigidity and perhaps also by the presence of definite tumour.

PERFORATING ULCER OF THE STOMACH is rare, but by no means unknown, without some history of previous symptoms.

The history, then, and the absence of features of enteric fever should aid in the differential diagnosis here.

Gesselswitsch and Wanach[23] describe symptoms resembling those of typhoid perforation which laparotomy showed to be due to splenic infarets and Bowlby[24] opened the abdomen only to find that scybala had given rise to symptoms of perforation. Such cases as these must be rare.

SUPPURATING MESENTERIC GLANDS, may produce symptoms closely resembling those of perforation. In the absence of diminution in the liver dullness and impaired note in the flanks and with signs of peritonitis present the abdomen should be explored.

PROGNOSIS

Phillips,[25] in speaking at a discussion at the Royal Medical and Chirurgical Society, recognised two sets of cases of perforation, namely those in which distention was present, and those with doughy belly and no marked symptoms. In the former type of case, he finds the prospects of life more hopeful, as in it the amount of extravasation of the contents of the bowel are likely to be less.

The amount of extravasation and the degree and extent of peritonitis found at the operation may influence the prognosis which must always be very hopeless when foeces in any quantity are found in the peritoneal cavity. The chances of recovery in children would seem to be greater than in adults. Elsberg[26], in proof of this, collected 289 cases operated upon for typhoidal perforation and in his paper he gives the following table:-

Total number of	Recoveries	75	or 25.9	p.c
" "	Deaths	214	" 74.1	"
" "	Adults	214	" 91.4	"
" "	Children	25	" 8.6	"
" "	Recoveries in adults	59	" 22.4	"
" "	Deaths " "	205	" 77.6	"
" "	Recoveries in Children	16	" 64.0	"
" "	Deaths " "	9	" 36.0	"

The mortality as shewn by this table, in children is 36 per cent. and in adults 77.6 per cent. Thus the chance of recovery in children is twice as great as in adults.

The recovery rate for females is greater than that for males. The most recent figures are given by Harte and Ashurst[27], who, in 311 cases found the percentage mortality in the male was 75.6 and in the female 63.3

A knowledge of these figures would hardly influence the prognosis in any given case, which in the present state of our knowledge must always be grave and cannot ever be very hopeful until at least three days have passed since the operation. In the near future, it may be anticipated that the mortality will be materially reduced when further experience in this field of surgery has been obtained, but the very condition of the patient, when operation is called for does away at once with any hope or belief that the results obtained from interference in the perforation of typhoid fever can ever compare favourably with the triumphs of surgery brought to bear on other abdominal diseases in which perforation of the bowel does not form a part.

TREATMENT

With the idea of minimising the possible effects in the production of perforation of irritating matters in the food, Dr. W. Gordon Pugh, of the North Eastern Fever Hospital suggested, and for some time the suggestion has been carried out, feeding the typhoid patient on whey.

Each adult patient is given three pints of whey daily and 6 drachms each of plasmon and lactose. The whey is given in quantities of five ounces two hourly, a drachm of plasmon and lactose being added alternately to each feed.

This method of feeding which is carried out only so long as the temperature is above the normal, has not had a sufficiently long trial to warrant a statement as to its efficacy in diminishing the number of cases that eventuate in perforation.

Whey is borne well, most of the patients in the North Eastern Hospital have not disliked it, the strength is well maintained under its use and the loss of flesh is certainly no more pronounced than when milk is employed as the diet. I am inclined to think the use of whey is productive of less loss of weight than that of milk.

From careful nursing too, much can be expected; the gentlest, most careful and patient handling should be employed in washing and moving those suffering from typhoid fever.

The patient himself should be warned, as I indicated, when dealing with the possible causes of perforation, to avoid rapid and unneceesary movements. Absolute physical and mental rest should be enjoined, and as far as possible, enforced.

Despite our every effort to avoid the causes of perforation it will arise in a certain number of cases and the diagnosis effected there is only one line of treatment open for adoption.

"Twenty years ago" says Ostler[28], speaking of the occurrence of perforation in typhoid, "we would fold our hands and murmur 'All is over' ". It is different now. In these days, perforation should be the signal for the greatest activity. Immediate operation should be performed.

The operation in itself in the majority of cases, is really not a difficult one. The importance of rapid execution in conjunction with thoroughness constitutes its chief difficulty. As Taylor[29] says: "The key to success depends upon getting into the ab-"domen early and out of it just as quickly as is con-

sistent with complete work".

In all the operations I have seen, chloroform has been employed as the anaesthetic. The frequency with which vomiting has occurred after the operation makes one ponder as to whether the chloroform may take a prominent part in its production and whether aether in this particular operation, as being more stimulating and less liable to induce sickness, might not be employed with more advantage.

After all precautions against sepsis have been taken, incision should be made in the right linea semilunaris and it should be at least three inches in length, its lower point being above the course of the deep epigastric artery. If this vessel is exposed, it may be dealt with by ligature and division.

Haemorrhage is insignificant but it should be checked before the peritoneum is opened.

The caecum is sought and when found, it and the appendix should be examined and the ileum should then be traced upwards, the bowels being treated as gently as possible.

The rupture located, every effort should be made to prevent extravasation and if adhesions prevent the perforation being brought to the surface the hole in

the gut must be protected by gauze pads until the adhesions have been broken down.

During these manipulations the eviserated bowel should be protected from cold by frequent application of hot sterilized cloths wrung out of antiseptic solution.

Brought to the surface, the rupture is now examined with a view to determining in what manner it shall be dealt with. Very usually the edges of the ulcer can be inverted and for this purpose fine silk threads in straight needles are used for the Lemberts sutures. Interrupted sutures should be used; they take longer to apply than a continuous suture, but if one stitch fails to hold in an uninterrupted suture, there is the possibility of the stitches all along the line becoming loose.

The diseased condition of the bowel may make inversion impossible without dangerous diminution of the calibre of the gut, and then the formation of an artificial anus is necessary, for resection and anastomosis of the bowel, the other course open, prolongs the operation dangerously.

The formation of an artificial anus has now been frequently resorted to; among English surgeons who have had to modify the operation in this way, are

Thompson[30] and Allingham.[31]

When inversion is completed, and a double longitudinal row of stitches should be used, search should be made for a second perforation, after which the bowel is thoroughly cleansed by gently drying, after washing outside the peritoneal cavity, or by intraperitoneal douching, according to the conditions found in the operation.

The question of the cleansing of the abdominal contents is an important one: it depends largely on the conditions obtaining at the time of operation. If much fluid and certainly if faeces have found their way into the peritoneal cavity lavage is imperative. If there is no extravasation and lymph only is present on the coils, it may be advisable to clean and dry the gut outside the abdominal wound and to dispense entirely with irrigation.

But as no two cases are alike, it is impossible to lay down hard and fast rules as to the treatment of the peritoneum, the particular fluid employed in cleansing and flushing out the abdominal cavity and the best method of drainage to employ.

The judgment of the surgeon and the results of his previous experiences in laparotomy for perforation

are called for in the closing stages of the operation, the condition of the patient also may exert its influence on his decisions.

Various divergencies from any routine mode of trsatment will be noticed in the notes of the North Eastern Hospital cases in the accounts of the operation but until much more work in this field has been done it is, as I have observed, futile to lay down any definite fixed rules and it will probably be found that various conditions of the patient will demand as many various modes of treating and draining the contents of the peritoneal cavity.

The wound in the abdominal wall should be closed leaving the lower part open when drainage is indicated. As time-saving and apparently having no bad effect, I prefer interrupted sutures, taking in all the layers of the abdominal wall.

The after treatment consists in minimising shock by warmth and the administration of strychnine hypodermically if necessary, the procuring of sleep where sleeplessness arises from pain, by morphia and for the first twenty-four hours at least giving only water in sips or ice in small pieces by the mouth. Nutrient enemata must be employed. In favourable cases after

twenty four hours, whey or diluted milk may be given in small quantities.

Subcutaneous injections of normal saline solution are of great value in the collapse following operation and they have been extensively used for this purpose in the North Eastern Hospital.

NORTH EASTERN HOSPITAL CASES

The following is a short account of Cases of Perforation occurring in the North Eastern Hospital, London, from 1901 to 1905.

CASE 1. E. H., female, aged 21 years.

Admitted 9th Dec. with a rather indefinite history of long illness extending over four months, during which period she had suffered a good deal from abdominal pain. Cough had been present for six weeks. The symptoms of typhoid probably dated from the 25th November, when headache began which continued up to the time of admission. Rose spots appeared on the 9th December. Vomiting occurred on the 10th and deafness had appeared during the early days of the more acute symptoms of illness.

The patient on admission was much exhausted; the apex beat was outside the nipple line; the impulse feeble. The lower lobe of the left lung was consolidated and she showed all the signs of pneumonia.

The abdomen was rather distended. The eruption was plentiful. The spleen could not be felt. Typhoid fever was diagnosed and the diagnosis was confiemed later by a positive result from Widal's reaction.

At 6.45 a.m. on the 10th December, pain occurred. It was referred to the left hypochondrium. Tenderness accompanied the pain. Shivering and a waxy appearance of the face were noted. The pain continued, the liver dulness disappeared towards 11 o'clock and operation was decided on.

At 12.15 p.m. the abdomen was opened, the perforation found and sutured with a double row of Lemberts sutures. The peritoneal cavity was flushed out with hot normal saline solution and the peritoneum stretched up separately. A drainage tube was inserted into the pelvis.

Desperately ill at the time of operation, a favourable result could not be hoped for and the patient died 12 hours after operation.

CASE 2. S. J., Female, aged 27 years, a member of the nursing staff.

Of the history of this case I have no record.

The following facts only from the Metropolitan Asylums Board Report for the year 1901 were obtainable. Perforation occurred on the 52nd day of disease and the 15th day of relapse.

Operation was begun 4 hours after the first sign of perforation was noticed. General peritonitis with turbid fluid was found when the peritoneum was opened; the perforation was found and it was necessary to stitch the bowel to the abdominal wall as the ulcer at the base of which the perforation occurred was so thick and indurated as to render inversion of the edges impossible.

This patient survived the operation for 60 hours during the first 24 of which considerable improvement was shewn.

CASE 3. A. H. Male, aged 17 years was admitted on the 30th June 1902.

The history was that of an acute onset. Head-ache shivering and sore throat were complained of on the 28th June; pain in the abdomen and diarrhoea set in the following day. Rose spots had appeared some days

previously so the illness was no doubt of longer duration than the bare history would indicate.

On admission, the tongue was coated; the heart and lungs were normal; the spleen was enlarged, another indication that the disease had existed prior to the 28th June; there was no distention, the liver dullness was not impaired and there were no spots.

On the 1st July, three rose spots were noticed on the back, chest and abdomen respectively. The spleen was tender. Heaviness was felt in the epigastrium after food.

The following day a crop of spots appeared on the abdomen and Widal's reaction being positive the diagnosis was unquestionable.

With the exception of the appearance of a rash, punctate in character and confined to the lateral regions of the trunk, the result possibly of an enema given on the 3rd July, nothing untoward occurred until the 8th July, when at 11 p.m. vomiting took place. Twice in the early hours of the 9th July and again at 8.30 a.m. curdled milk was vomited. There was no pain but the abdomen was rigid, motionless and tender. No rigor occurred and the liver dullness was unimpaired.

At 3 p.m. chloroform was administered and an ex-

ploratory incision was made in the right linea semi-lunaris. Fluid and bubbles of gas excaped on opening the peritoneum. The coils of gut were intensely congested and, traced up from the caecum, a perforation was discovered in a thick walled ulcer. The perforation was about 1/9 inch in diameter. The walls of the gut at the seat of perforation were too thick to admit of a double row of imaginating sutures so the edges of the perforation were first brought together by sutures and then a row of Lembert's sutures was employed.

The pelvis was washed out with sterilized water and the wound closed.

Frequent vomiting took place when consciousness was recovered and at midnight a saline injection of 20 ounces was given and rectal feeding was adopted.

On the 10th July the only complaint was of tenderness in the epigastrium.

The patient did not obtain much sleep; he became restless on the 11th July and died at 7.5 p.m. on the 12th.

The autopsy showed general peritonitis with semi-purulent fluid in the pelvis and loins. The bowel was water tight.

CASE 4. H. J., Male, aged 23 years.

Admitted 2nd July 1902.

The illness began on the 10th June with headache. Shivering occurred on the following day; cough on the 16th. Diarrhoea had been present since the 10th. He was last at work on the 27th June and had been in bed since the 28th June.

On admission the tongue was glazed and cracked, the fauces injected with much sticky mucus about the pharynx. The heart and lungs were healthy. The abdomen was not distended; the spleen could not be felt; the liver dullness was unimpaired; there was no tenderness. Several spots were present on the abdomen and chest. Temperature 101° F. On 3rd July severe headache was complained of. Blood was drawn and a positive result was found with Widal's test.

On the 6th July, several petechiae appeared among the now numerous rose spots on the abdomen and thighs.

During the two following days the abdomen became more tense and tenderness developed in the hypogastrium

On the 12th July complaint of sharp pain in the lower abdomen was made. The abdomen was distended, but was not rigid and was moving freely.

At 3.30 in the morning of the 14th July a rigor

set in and lasted for half an hour. Pulse smaller and more rapid than before. Abdomen not more rigid and still moved well with respiration. Liver dullness unaltered. No vomiting took place. The pain was still present. At 10.20 a.m. there was marked tenderness below the umbilicus extending to each iliac fossa. Abdomen still moving but liver dullness almost entirely obscured.

At 12.30 p.m. chloroform was administered and the abdominal cavity opened by an incision in the right linea semilunaris. Gas and bile stained fluid escaped.

The intestimes were inflamed and shewed lymph exudation. There was also pus in the peritoneal cavity. There was no foecal odour. Search was made, but no perforation was found, nor was there evidence of ulceration in the small intestine. The vermiform appendix was healthy.

A second incision was made over the gall bladder which was found to be healthy, as were the stomach and duodenum. The peritoneum and gut in the upper abdomen were not inflamed.

On the 15th jaundice set in. At 4 a.m. on the 16th slight but well marked haemorrhage occurred, this was renewed at 3.15 p.m.

Death took place at 2.25 a.m. on the 17th July.

At the post-mortem examination the perforation was found in the anterior wall of the rectum eight inches from the anus. A second perforation was found in the sigmoid flexure 6 inches higher up. There were numerous shallow ulcers in the large intestine. The ileum shewed only very slight signs of ulceration.

CASE 5. F. K., Female, aged 6½ years.

Admitted July 26th 1902.

The illness had existed some three weeks, beginning with headache on the 3rd June, sore throat on the 10th June and vomiting on the same day. Frequent vomiting had taken place since. Diarrhoea began the day before admission.

The patient on admission was pale with tongue furred in the middle, red at the tip and edges. Pulse soft; first sound faint and muffled. Bronchitis was present.

Rose spots were present. The abdomen was flaccid and there was diffuse tenderness. The liver dullness was normal; the spleen was readily palpable.

The temperature was norwal on the 2nd August and convalescence was proceeding apparently satisfactorily when at 10.40 a.m. on the 16th August, sudden pain

set in during the use of the bed pan, chiefly in the region of the caecum, a severe rigor and marked pallor immediately succeeded the onset of the pain. The pulse rapidly rose from 128 to 180 beats a minute. Immobility, tenderness and rigidity of the abdominal walls quickly followed and at 12.40, just two hours after the first symptom the liver dullness had disappeared.

Laparotomy was performed at 1.10 p.m. Omentum inflated by gas appeared in the wound which was made in the right linea semilunaris.

The perforation as expected proved to be a large one. It was closed by two longitudinal rows of stitches and the abdominal cavity was flushed with sterilized hot water. Foeces and yellow fluid escaped from the right loin, clear fluid returned from the left loin. Two glass drainage tubes were left in the wound, one extending into the pelvis, the other under the liver and a counter opening was made in the right loin and an india rubber tube inserted.

On the 17th August the wound was dressed at 1 p.m. and 6.30 p.m. Slight pain above the pubes and in the wound in the right loin only was complained of.

On the 18th August the bowels were opened. She

vomited at 11 a.m.

On the 19th August diarrhoea set in, three loose stools of considerable size were passed and vomiting occurred five times; the temperature reached 105; there were no signs of peritonitis and it seemed that the child was suffering from a severe relapse. On the 20th August, the lower stitches in the sbdominal wound had given way.

On the 22nd August the signs of general peritonitis developed and the patient gradually sinking, died at 5 a.m. on the 23rd August.

At the autopsy, the peritoneum was inflamed, buttery lymph and yellow fluid were present between all the coils of intestine.

On examining the region of perforation, a minute puncture was found just beyond the line of stitches and at the edge of the large ulcer in which perforation had occurred. No foeces had excaped and it had probably been caused by traction during the manipulation at the post mortem. The stitches had held and the perforation was permanently closed.

CASE 6. H. B. Male, aged 10 years.

Admitted 6th Sept. 1902.

He had had headache on the 6th and 9th Sept., rigors on the 13th and 14th Sept. and abdominal pain from the 12th to the 15th Sept.

On admission the tongue was coated with stripped margin and centre.

The heart and lungs were normal.

The abdomen was distended and tympanitic; the liver dullness was normal. The spleen was not felt. Rose spots were present on the abdomen and chest. The temperature was 102.4 F. The pulse 96 and the respirations 28.

On the 18th a little retching occurred. Widal's reaction proved positive.

On the 19th Sept. the first motion since the beginning of the illness was passed; it was liquid and contained a few curds.

At mid-day on the 22nd Sept. pain began in the region of the unbilicus, the abdominal wall was tense and the knees were drawn up. The pulse was 112.

At 12.30 the pain had extended to the upper abdomen and at 5.20 definite signs of peritonitis were present, the abdomen was distended, tender and rigid, the liver dullness was absent and the boy was pale and collapsed.

The abdomen was opened at 7 p.m. Much gas and yellowish fluid escaped. The coils of intestine were injected.

The perforation was minute and situate some 12 inches from the caecum.

The bowel wall was inverted by two longitudinal rows of sutures. Glass drainage tubes were placed in the abdominal wound, one reaching down to the pelvis and the other reaching up under the liver. Two openings were made in the loins and large rubber tubes inserted. Flushing with sterilized hot water was employed. The patient was in bed 45 minutes after leaving it although 12 minutes were occupied in localizing the perforation.

For two days after operation vomiting occurred; frequently at first, it gradually subsided and on the 25th Sept. the note was made that no vomiting had taken place since 2.30 p.m. on the previous day.

On the 26th Sept. it was found that a piece of the omentum had prolapsed into the left loin wound.

On the 27th Sept. much distention was present, vomiting began again and death took place at 3.12 p.m.

At the post-mortem examination little lymph or fluid was present, but well marked peritonitis was

apparent in the loins, pelvis and upper right quadrant of the abdomen. The small and large gut were alike enormously distended. The stitches were holding well and the bowel was watertight. There were many small and deep ulcers of the small intestine.

CASE 7. J. A. Female, aged 12 years.

Admitted 12th Sept. 1902.

Headache had begun on the 1st Sept., abdominal pain followed on the 9th Sept. on the 11th Sept. there was some bronchitis and the rash appeared on the 12th Sept.

On admission the tongue was furred and dry, the breath was foul, sordes were present on the teeth and lips.

The heart was healthy. Slight bronchitis was present.

The abdomen was flat; the liver dullness was normal. The spleen was palpable.

On the day following admission the tongue was moist, there was no headache and the child appeared better.

On the 14th Sept. there was much restlessness during the day and delirium at night. Widal's test gave a positive result.

Progress was good and convalescence was becoming established, when on the 3rd Oct. the temperature rose and this proved to be the beginning of a relapse of a mild type.

On the 19th Oct. at 8 p.m. an enema was given. At 5.30 a.m. pain set in in the lower abdomen. The pulse rate was increased and a drop took place in the temperature. The liver dullness never entirely disappeared, but at 8.15 it was diminished and the patient was pale and pinched, abdominal tenderness and pain were increased. Rigidity was present.

At 12.20 p.m. laporotomy was performed. Gas and turbid fluid were present in the peritoneal cavity.

The perforation was readily found and sutured. It was crescentic in outline and was within a foot of the caecum. Counter openings were made in the loins and gauze drainage was employed. The abdominal cavity was flushed with Solution of Lysol in the strength 1-250.

On the 25th, the gauze drains were removed under chloroform, the upper anterior tube was found to be adherent to bowel and to omentum.

A small stitch abscess was opened.

The general condition was excellent.

Recovery was delayed by the slow healing of the

lower part of the abdominal wound and by a second relapse, also of a mild character, but on the 30th December the child left the hospital perfectly well.

CASE 8. J. S. Male, aged 22 years.

Admitted January 19th 1903.

On the 10th Jan. the illness began with a cough. Diarrhoea had been present daily since the 14th Jan.

He vomited on the 15th Jan. and 17th Jan.

On admission he looked well, the face was flushed the tongue dry. The heart sounds were normal. He had a mild grade of bronchitis. The abdomen was flat and there was no pain or tenderness. The liver dulness was normal and the spleen could not be felt. There was a good crop of rose spots. Widal's reaction was positive.

Diarrhoea was a prominent feature of the attack and on the 3rd Feb. sloughs appeared in the stools, together with some blood. The bronchitis had become more pronounced.

On 4th Feb. at 10.5 a.m. rigor set in followed at 11.15 a.m. by a small stool containing blood.

In the evening of the same day the girth, taken at the level of the umbilicus, had increased ½ an inch. There had been no further haemorrhage. The pulse was

of good quality, 106; it had previously not reached 100 beats a minute. The bowels acted at 9 p.m. There had been no pain.

On the 5th Feb. there was still entire freedom from pain, the stools were just coloured, but there was no fresh blood. The pulse was 84.

There was no further haemorrhage and all went well until 10 a.m. on the 12th Deb. when in the act of defoecation sudden pain occurred in the lower part of the abdomen. At 11.30 the abdomen was flat and the flanks were resonant; the girth had shewn no increase; the pulse rate rose to 100; the patient was drowsy.

At 1 p.m. diminished resonance was found in the right flank and the pulse was 140.

Ay 2.15 p.m. both flanks were dull to percussion and the pulse was 144; the girth was unchanged.

At 4 and 5 p.m. the condition was the same, the pain was continuous but had not become more severe. Tenderness was present. The liver dullness was unimpaired.

At the latter hour an exploratory incision was made over the right linea semilunaris and the peritonal cavity opened. The intestine was found adhering to the anterior abdominal wall. On separating the

bowel from the right margin of the wound, which was readily accomplished, a considerable quantity of turbid fluid and gas excaped. The caecum was found on separating the adhesions on the left side of the wound. It was adherent by recent lymph to the surrounding coils of gut. From these it was gently separated and when about 6 inches of the adjacent small intestine had been exposed a sudden gush of liquid foeces took place. Further breaking down of adhesions brought the perforation into view. The floor of the ulcer was represented only by peritoneum in which there were two large perforations. These were closed by two rows of many sutures. Drainage was effected by loin tubes, the many adhesions preventing the introduction of tubes through the wound into the pelvis. A gauze plug was used here. Solution of Lysol 1-250 was used for flushing the abdominal cavity.

The patient was warm after the operation and the pulse was fairly good, although very rapid, 150.

He rallied slightly for a few hours, but died at 6.25 a.m. on the day following the operation.

Permission to make a post-mortem examination was unfortunately not obtained.

CASE 9. A.C. Female, aged 22 years.

Admitted 8th August 1903.

The illness began on 31st July with headache and shivering, since which date she had not felt well although she had not taken to her bed. Occasional attacks of nausea had occurred and diarrhoea had persisted for a week prior to her admission.

On admission the tongue was moist with a thin fur on the dorsum. The heart and lungs were normal. The abdomen was not distended, there was no pain or tenderness. There were no spots and the spleen was not palpable. The temperature was 101°F., the pulse 96 and decrotic in character.

On the 9th August, the result of Widal's test was not quite conclusive, but four days later the characteristic clumping with loss of motility of the bacilli was evident.

A moderately severe attack was quickly followed by a mild relapse and on the 11th day of this, on 7th Sept. vomiting twice took place, closely following which pain with marked tenderness over the right lower ribs was complained of. This was at 8.30 a.m. and at 1.10 p.m. the pulse had increased from 98 to 134. The eyes appeared sunken and the nose blueish. Pain

was now also present in the region of the spleen and tenderness was found in the right iliae fossa. The abdomen was now almost motionless.

At 2.10 p.m. the pulse was still 134, and now the liver dullness had disappeared.

At 3.30 p.m. under chloroform the abdominal cavity was opened. The transverse colon presented and on traction being made upon it, gas and yellow fluid with flakes of yellow foeces made their appearance. The perforation was large and was found in a thick deep ulcer some 18 inches from the caecum. Invagination was performed with two longitudinal rows of Lembert's sutures. Lysol 1-250 was used to irrigate the bowels. Counter openings were made in both loins and rubber tubes were used.

Thin watery pus was found in the subsequent dressings.

Death took place from peritonitis at 5.15 a.m. on the 9th Sept.

No post-mortem was held.

CASE 10. W. G. Male, aged 33 years.

Admitted 3rd October 1903.

The onset of illness was gradual, headache and malaise being borne for a day or two before the 24th

Sept. when work had to be discontinued. The patient had been in bed since the 25th Sept. On the day of admission the rash appeared and haemorrhage from the bowel took place.

On admission the tongue was lightly furred, dry and cracked. The heart was acting weakly. A few coarse rhonchi were heard over the lungs. The abdomen was a little distended, but not tender. Many rose spots were present on the chest and abdomen. The spleen could not be felt. Liver dullness was unimpaired. The pulse was 104 and dicrotic in character.

At 6.10 p.m. on the day of admission seven ounces of nearly pure blood was passed. At 3.30 a.m. on Oct. 5th a rigor took place, lasting for 10 minutes. Change in the facies was notices at 4.30, a distressed look. Pulse 106. Abdomen tender but no pain. Liver dullness was obscured but not lost. The note in the right flank was impaired.

At 5.30 a.m. the note in the flank was less resonant and the liver dullness was absent. The abdomen was moving freely. There was no definite tenderness. the pulse rate had risen to 114.

The peritoneal cavity was opened at 6 a.m., a large quantity of gas escaping and a moderate amount of turbid fluid containing flakes of lymph. The small

intestine was distended and general peritonitis was present. The perforation was discovered 1 inch from the caecum, the ruptured ulcer being adherent in part to the pelvic brim.. When exposed the perforation was oblong in outline and measured 1 inch by ½ an inch the whole floor of the ulcer having disappeared. The edges of the ulcer were brought together by a continuous suture which was supported by a row of Lembert's sutures. The abdominal contents were dried and cleansed with sponges and counter openings were made in the loins.

At the conclusion of the operation the pulse rate was 120. Vomiting occurred and at 4 a.m. on the 6th Oct. and subsequently some mouthfuls of fluid were brought up from time to time.

Dressed at 1 p.m., the abdomen was seen to be somewhat distended. Pulse 102 and stronger. At 10 p.m. distention was very much increased and the bowel was punctured. This gave considerable relief. Vomiting was noted at 10.30 p.m.

The bowels moved on the 7th Oct. at 5 p.m. There was no vomiting all day.

On the 8th October vomiting again set in. The bowels were freely opened three times. The tubes

were washed through with lysol solution 1-250.

During the next two days good progress was made.

Much pain in the wound rendering efficient dressing impracticable, the use of chloroform during the dressings became necessary. On the 10th Oct. at 3.45 a.m. a small haemorrhage occurred. At 4.10 a.m. a much larger one, and bleeding recurred at 4.25, 4.30 p.m., 5.45, p.m. and finally a profuse haemorrhage at 7.20 caused complete collapse and death took place at 8.35 p. p.m.

Post mortem examination revealed slight general peritonitis; bowels adherent only in pelvis. In breaking away adhesions an opening was made in the bowel at a point where it was very firmly adherent to the pelvic brim.

CASE 11. W. H. Male, aged 18 years.

Admitted 5th October 1903.

The beginning of illness was marked by headache on 29th Sept., pain in the back on 1st. Oct. and pain in the abdomen on 2nd Oct. Diarrhoea began on the 3rd Oct. and on the 4th Oct. shivering and delirium were present.

On admission the patient looked ill; the tongue was coated and dry; sordes on teeth and lips. The

heart's action was weak. Pulse 102. Air entry was deficient at the bases of the lungs. There was no rash. The abdomen was flat and resonant all over; the liver dullness was present; the spleen could not be felt.

On the 6th Oct. delirium was present but tenderness on palpation of the abdomen was elicited. Rose spots made their appearance on the abdomen and back. Delirium disappeared and the patient's condition was shewing daily improvement until 3 p.m. on 11th Oct. when a rigor set in together with pain and tenderness in the lower obdomen, more marked on the right side; insignificant pain which had caused no complaint was present for some two hours before the rigor began. The note in the left loin was impaired.

At 3.35 p.m. the note in the right loin had become impaired; the pain was chiefly round the umbilicus. The pulse rate was increased from 94 before the onset of the rigor to 108.

At 5 p.m. the pulse was 138. The note was dull in the right loin, the Area percussed becoming resonant when sounded with the patient on his left side.

Pain persisted and the liver dullness became obscure; rigidity was now added to the other signs of perforation and laparotomy was performed at 5.30 p.m.

Gas and yellowish fluid escaped when the peritoneum was incised. A coil of much injected small intestine presented. The caecum was brought to the surface and in the small intestine just above it the offending ulcer was found. Attached by firm adhesions to its base was one of the appendices epiploicae of the ascending colon. The perforation was found adjacent to this attachment. The appendix epiploica was ligatured in two places and cut. Invagination of the gut was effected by longitudinal sutures. The bowel was cleansed by means of sponges, loin openings were made and large rubber tubes packed with gauze were employed as drains.

At 9 p.m. there was abdominal pain. Pulse small and soft and variable. The signs of peritonitis never cleared up and death occurred at 3.10 p.m. on the 12th Oct.

No autopsy was held.

CASE 12. F. K. Male, aged 22 years.

Admitted 11th November 1903.

Ill for some days with headache and malaise, this patient gave up his work on the 3rd Nov. but only took to his bed on the 9th Nov. Diarrhoea began on the 3rd Nov., nausea on the 4th Nov., cough on the 9th Nov.

and he vomited on the 10th Nov.

On admission the tongue was clean and moist. There was a soft apical systotic bruit. The pulse was 84 and dicrotic. Slight general bronchitis was present. There was tenderness in the lower abdomen. The liver dullness was unimpaired; the spleen was not palpable. Rose spots were present. The temperature was 103.8.

The attack was of a sharp nature but no complication occurred and all appeared to be going well until the 2nd Dec.

At 12.45 p.m. on this day an enema was given and at 4 p.m. pain was complained of chiefly to the left of and above the pubes where tenderness also existed.

At 6 p.m. no further signs had developed, but vomiting took place during examination. Pulse 92.

At 8.30 p.m. pain began in the left flank shortly after taking peptonised milk and pain on movement was felt round the unbilicus. Flanks resonant and liver dullness unchanged. Pulse 93.

At 1 a.m. on 3rd Dec. the pain became rather worse.

At 6.45 a.m. vomiting occurred. At 10.15 a.m. the pulse was 98. Abdominal movement had become restricted in the lower part. Tenderness was less but liver dullness had partly disappeared and the flank note had

become impaired.

Operation was performed just after midday. Turbid fluid presented but no gas was noticed.

The coilsof intestine were firmly matted together. The perforation was in a portion of the small gut which adhered firmly to the ascending colon. The part containing the perforation was partially shut off from the general peritoneal cavity. The condition of the parts rendered suture of the perforation impossible without breaking down very firm adhesions, so gauze packing was employed and the perforation isolated by its means. Strips of gauze were used as drains and tubes were placed in counter openings in the loins, through which a quantity of fluid immediately flowed.

At 6.15 p.m. and at 8.30 and subsequently, frequent vomiting took place and the stomach was washed out.

On the 4th Dec. vomiting continued at intervals and distemtion was relieved by pricking the bowel.

During the 5th Dec. much improvement in the appearance was seen. There was still distention and puncture was again employed. On the 6th Dec. the bowels moved three times and there was no vomiting.

On the 7th Dec. the condition was good. The wound was large and there was much discharge from it but complete separation from the peritoneal cavity was ap-

parently effected. There was now no distention and no discomfort and vomiting had entirely ceased for three days when at 2.15 p.m. on the 8th Dec. collapse suddenly set in and though the patient rallied under stimulants for a time, death followed at 4.p.m. on the next day, the 9th Dec.

At the post-mortem examination general peritonitis was found and a small collection of pus in the coils under the liver.

The mitral valve, as was indicated in the notes of the condition on admission, was not fully competent.

CASE 13. S. E. Female, aged 33 years.

Admitted 28th March 1904.

This patient was last in good health on 7th March. She had been in bed since 14th March. Back ache and pains in the limbs were added to the pre-existing headache on the 21st Mar. Rose spots developed on the 26th Mar. and severe retching on the 27th and 28th Mar.

On admission the tongue was dry and was covered with a thick brown fur. There were sordes on the teeth and lips. The heart and lungs were healthy. The pulse rate was 120. There was no tenderness or pain in the abdomen and no distention. The liver dullness was normal and the spleen was not felt. The tem-

perature was 101.2° F.

Slight bronchitis with troublesome cough was present on 1st. April. Widal's reaction gave a positive result.

On the 5th April vomiting twice occurred.

At 6.50 p.m. on the 9th April the patient was observed to be shivering. On being questioned complaint of pain in the right iliae fossa was made. The bowels acted twice during the rigor and again immediately after its cessation. The abdomen was moving freely and the flanks were resonant. The pulse rate was 148; the highest rate recorded during the illness being 128 and the previous count giving 124.

At 8 p.m. there was no pain but slight tenderness and rigidity confined to the right iliae fossa. The liver dullness remained.

At 10.20 p.m. the abdomen was explored. Several drachms of turbid fluid escaped but no gas bubbles were seen. Yellow flakes of lymph floated in the fluid. The caecum was surrounded by a hard firm mass, probably a result of former inflamation. 18 inches from it the perforation was found. The parietal peritoneum and the coils of gut were much inflamed and shewed small haemorrhages. A large slough was situate in the perforated ulcer which resulted in a considerable reduc-

tion of the lumen of the bowel after invagination. A counter opening in the right loin was made. Sponging was employed for the abdominal contents.

The operation lasted 1 hour.

On the 10th April there was no vomiting but the breathing became rapid and signs of pneumonia developed which resulted in death the following day at 11.35 p.m.

The condition noticed at the post mortem resembled that seen at the operation; there was no extention of the peritonitis and the stitches were doing their work quite efficiently.

CASE 14. E. C. Female, aged 16 years.

Admitted 11th June 1904.

Malaise with loss of appetite had been present for three weeks. She was at work on the 4th June. Headache began on the 5th June and pain in the abdomen on the 6th June.

On admission the tongue was covered with a dry thick, brown coat. The heart and lungs were healthy. A few spots were present. The abdomen presented no deviation from the normal.

At 10.40 p.m. on the day of admission, colicky pains occurred. On the 18th June, sharp haemorrhage

from the bowel was succeeded on the 19th June at 8 p.m. by pain, sudden and of such severity as to cause the patient to cry out. At 9.15 p.m. vomiting and a short rigor occurred. At 9.35 p.m. the pain, which was situate below and to the right of the umbilicus, was less. There was general tenderness.

Shortly after midnight slight change in the percussion note over the liver was recognised. There was no dulness in the flanks. The pulse rate was gradually increasing.

At 2 a.m. on the 20th June, operation was performed

Gas and yellow fluid with yellow foecal matter welled up on opening the peritoneum. The intestines were not much injected. About 12 inches from the caecum the perforation was found, it was circular and large and placed in the middle of a thick ulcer. There was no deposit of lymph except a very small quantity adjacent to the perforation. A double row of Lembert's sutures closed the opening. Sponging was employed and one counter opening was made in the right loin.

During the early morning there was some slight amount of haemorrhage from the bowel. The general condition was good at night.

On the 21st June, jaundice was noticed. At 4.30 p.m. vomiting and shivering followed by severe abdominal pain. The pulse became wiry and the patient died at 7.5 p.m.

The autopsy revealed general septic peritonitis. The wound in the bowel was firmly closed and the gut was water-tight.

CASE 15. T. H. Male aged, 21 years.

Admitted 5th October 1904.

Headache began on the 23rd Sept. pain in the abdomen on the 24th Sept. diarrhoea and the typhoid rash appeared the day before being brought to the hospital.

On admission the tongue was coated. The heart was normal. There was slight bronchitis. There was no tenderness or pain in the abdomen, which moved well; the liver dullness was unimpaired and the flanks were resonant.

At 8.15 p.m. on the day of admission pain came on: it was principally in the lower part of the abdomen. The liver dullness was unchanged. At 11.5 p.m. the pain was still present but in addition the percussion note in the flanks, especially that on the right side, was impaired, the abdomen, still moving, had a diminish-

ed range, some general tenderness and rigidity had supervened and the pulse rate was slightly increased, from 98 to 104. At 12 midnight, there was less movement of the abdomen, pain was constant with exacerbations, tenderness and rigidity persisted, the pulse rate was gradually increasing, 110. There was more dulness in the right flank.

At 8.15 a.m. on the 6th Oct. the patient vomited and at 9.30 the liver dulness was impaired and the pulse rate had increased, to 130.

Laparotomy was performed at noon. Gas and turbid fluid with foecal matter gushed from the wound. The perforation was found at the apex of a Meckel's diverticulum situate about 18 inches from the ileo-caecal valve. The ulcer in which the perforation existed was invaginated and sutured. This, from the peculair site of the perforation was effected with no diminution of the calibre of the gut.

Frequent vomiting followed the operation and death ensued from shock at 3.15 a.m. on the 7th Oct.

At the necropsy well marked typhoid ulceration of the small intestine was found. There was no general peritonitis. The bowel was watertight, the stitches holding well

CASE 16. H. C. Male aged 33 years.

Admitted 25th October 1904.

The patient was last at work on the 13th Oct.

Headache began on the 15th Oct. Diarrhoea and abdominal pain on the 16th Oct., fits of shivering on the 17th Oct. and vomiting on the 23rd Oct. The rash appeared on the day of admission.

The tongue, on admission, was red and showed patches of fur. Examination of the thoracic and abdominal organs gave no indication of disease.

On the 5th Nov. at 2 p.m. a simple enema was given resulting in a large stool. Three hours later pain was felt in the abdomen. The pain gradually subsided. On the 6th Nov. at 12 noon, colicky pain came on and lasted for 10 minutes. The pulse was 92. There was dulness in the right flank, some general rigidity, deep-seated tenderness was present in the left groin and on the right side immediately below and to the right of the umbilicus. Liver dulness was unimpaired. Frequent borborygmi were heard.

There was no further pain until 11 a.m. on the 7th Nov. Both flanks were then resonant, the abdomen was not moving very freely. Rigidity and tenderness on deep pressure persisted. Pulse rate 90. At 12 o'clock

the patient vomited; at 12.45 p.m. marked rigidity of the lower obdomen was present, the right flank was again dull and the liver dullness had disappeared.

Vomiting occurred several times up till 2 p.m., when the pulse rate was 114.

Operation was performed at 3.30 p.m. The peritoneum contained free gas and greenish flakes of foeces. The caecum presented. The ileum immediately adjacent to the caecum was adherent to the psoas for a distance of 1¼ inches; gentle traction on the bowel was followed by a rush of gas, yellow liquid and flakes of foeces The exact point of exit could not be localised and the bowel was traced on for a further six inches where it was found weakly adherent to the back of the pubic region; these adhesions readily gave way and disclosed a cleanly punched out perforation in the middle of the now bleeding adhesion. There was much yellow lymph on the bowel which was intensely injected. Saline solution was used to flush the abdomen and tubes were placed in the bottom of the wound and in counter openings in the loins. The operation lasted 90 minutes.

On the 8th Nov. there was foecal discharge from the anterior wound and at 4 p.m. a second operation was performed. The bowel was found to adhere to the abdomenal wall. No foeces were sucked up from the pelvis

nor was there any sign of foeces from the loin tubes.

During the 9th Nov. the patient seemed better, but vomiting began at 4 a.m. on the 10th Nov. and continued at intervals up till the time of death, 7.55 a.m on the 11th Nov.

At the post mortem examination a small collection of pus was found behind the transverse colon. The stitches in the perforating ulcer were holding well and the gut was water-tight.

A large ragged opening was found on removing the adhesions to the psoas. It measured 1 inch in diameter. The bowels were matter together and were adherent to the abdominal walls. No foeces were found and it was probable that the opening which was not discovered at the time of operation had again become occluded by lymph exudate.

CASE 17. W. L. Male, aged 30 years.

Admitted 25th Novemner 1904.

This patient was last well on 3rd Nov. after which date he suffered from headache and malaise. He worked on till the 19th Nov. when he took to his bed. He had sore throat and diarrhoea on the 19th Nov., vomited on the 22nd Nov. and pain in the abdomen began on the 23rd Nov.

On admission the tongue was dry and furred and the

buccal mucosa and that of the pharynx were inflamed. The heart and lungs were healthy. Objective examination of the abdomen revealed nothing abnormal beyond the presence of one or two doubtful spots.

At 8.30 a.m. on the 29th Nov. immediately after the bowels had acted, pain was felt in the abdomen. At 9.20 the abdomen was moving very slightly, tenderness and rigidity were marked. There was dulness in the right flank and the liver dulness was obscured. The patient was pale and vomited once. The pulse rate, which had ranged from 88 ro 96 previously, had risen to 105.

At 11 a.m. Laparotomy was performed. Gas, turbid fluid and flakes of lymph escaped through the opening in the peritoneum. Eight inches from the caecum a small punched out ulcer was found.

Invagination was effected by two rows of Lembert's sutures. The peritoneal cavity was flushed out with normal saline solution and 1½ pints of the fluid were left in. The wound was entirely closed. At 3 p.m. there was no pain, the tongue was moist, the patient was cheerful and felt much better. Remaining in this condition until 10.30 p.m. the heart suddenly failed and he died unexpectedly soon after this time, in spite of every effort made to induce a rally.

The post-mortem showed the gut in the region of the wound to be injected. There was no sign of peritonitis elsewhere. There was a slight amount of turbid fluid in the pelvis. The ileum was quite water tight at the seat of the sutures.

The heart muscle was flabby and friable, the right ventricle was dilated, the left hypertrophied. The capsules of the kidneys were adherent, the cortices diminished and the organs were in an early stage of granular contraction.

CASE 18. E. T. Male, aged 37.

Admitted 22nd December 1904.

Headache began on the 17th Dec. vomiting on the 18th Dec., diarrhoea on the 19th and pain in the abdomen on the 22nd Dec., on which date spots appeared. For some days previous to the onset of these symptoms there had been general malaise.

On admission the tongue was thickly furred, The heart and lungs were healthy. The abdomen moved well, liver dullness was normal, the note in the right flank was unimpaired. Rose spots were present.

The attack proved to be one of considerable severity and delirium was present not infrequently.

On 29th Dec. at 6.30 a.m. complaint of pain was

made. The affected part was in the epigastric region chiefly at the right of this area. The pain was intermittent and was not increased on pressure. The pulse was 88. Nausea was complained of. There was no vomiting.

At 11 a.m. the right iliac region was tender, there was little rigidity. The liver dulness had disappeared.

Operation was performed at 2 p.m. Much difficulty was experienced by the anaesthetist in getting the patient under chloroform; he struggled violently and was very noisy. Incision of the peritoneum was followed by the appearance of brownish yellow fluid and gas. The perforation was found 12 inches from the ileo-caecal valve. It was $\frac{1}{8}$ inch in diameter. There was a moderate degree of peritonitis. The peritoneal cavity was flushed with saline solution. No counter openings were made. During stitching of the peritoneum a violent cough caused rupture of the sutures and eventration. The bowel was returned and the would sutured through the whole thickness of the abdominal wall. The patient never rallied from the operation and consciousness was not completely recovered.

Death took place at 10.30 p.m. on 29th Dec.

At the post-mortem examination general peritonitis was present. The ileum was much ulcerated. The gut was watertight.

CASE 19. W. B. Male, aged 23 years.

Admitted 13th December 1904.

The illness had lasted some three weeks, headache and cough being early symptoms; diarrhoea and the characteristic rash developed shortly before admission.

On admission the tongue was furred in the middle, red at the tip and edges. The heart was healthy. A few high-pitched rhorchi were heard over the chest wall. The liver dulness was normal and there was no distention. A copious crop of rose spots was present. The illness took a normal course until the 20th Dec. At 6 a.m. pain in the abdomen began. The pulse was then 88; there was no tenderness. The liver dulness was present. A dull note was found in the right flank; at 11 a.m. the abdomen had become rigid, the liver dulness had nearly disappeared and the pulse was 112, at 11.15 a.m. it had risen to 120 and at 12.15 p.m. to 130.

Laparotomy was done at 12.50. Gas and yellow fluid escaped. The perforation was small and was situate 10 inches from the ileo-caecal valve. Two rows of Lembert's sutures were used; the coils were washed with normal saline solution and dried subsequently with gauze

swabs squeezed dry. A drainage tube was inserted in the bottom of the wound. On the day following operation there was no vomiting and the pulse was 100.

Convalescence was much delayed by suppuration in the stitches in the abdominal wall, and the consequent necessity for their removal.

An attempt was made to bring the edges of the wound together by stitches, chloroform being administered, but it failed to give good results, the difficulties in the way of success being much accentuated by the cough from which the patient still suffered.

On the 3rd April 1905, the patient was still in the hospital, but he was fat and looked in excellent health was getting up and going out each day and was on a full mixed diet. Undoubtedly there is a weak scar in the abdominal wall, but this is apparently the only ill effect of the operation and though some support will have to be worn for a considerable time, it is hoped the time may come when the use of this can be discontinued.

CASE 20. W. B. Male, aged 10½ years.

Admitted 19th January 1905.

Headache began three weeks ago and was followed by diarrhoea immediately, together with occasional abdominal pains. Delirium was present on the 16th January.

On admission the tongue was thickly furred. Bronchitis was present. There was an apical systolic bruit.

The abdomen was distended; there was no pain or tenderness. Rose spots were present.

On 20th Jan. at 9.30 p.m. immediately following an action of the bowels sudden pain in the left side of the abdomen developed; the flanks were resonant and the liver dulness was unaffected; the abdomen was tender and was still considerably distended.

At 11.30 p.m. the pain was still present but there was free gas in the abdomen as evidenced by the partial disappearance of the liver dulness. Laparotomy was performed at 12.15 a.m. A four inch incision was made in the right linea semilunaris. A large quantity of gas and slightly turbid fluid escaped. The perforation itself presented in the wound and was at once isolated and inverted, two rows of sutures being employed. The perforation proved to be some two feet from the ileo-caecal valve. About 12 inches from the valve a second ulcer was found, apparently on the point of perforation, its base consisted of peritoneum only and this was, in its centre, of a dull greyish hue. Yet a third ulcer almost but not quite so threatening was invaginated. No flushing was employed; the gut

was washed and dried with gauze sponges. The wound was sutured in three layers.

No vomiting took place but on the 25th January, the stitches began to give way. Trouble arose from some oedema of the chest wall with slight emphysema following saline injections given after the operation. On the 26th most of the stitches were removed and strapping was employed.

The wound was clean and dry.

Excellent progress was made, food was being taken well and every hope of a speedy recovery was only dispelled by an accident on 30th January. Cough had all along been rather troublesome and great care had always been exercised during the dressings, but on this particular day a sudden and violent fit of coughing caused the bowel to shoot up past the restraining hand. A very considerable length of the small intestine was extruded; the bowel was washed with saline solution and returned, under chloroform, with all speed. Irreparable damage had however been sustained. Signs of acute peritonitis set in and death occurred on the 1st Feb. at 11.10 a.m.

At the post mortem examination general acute peritonitis was present. All those parts of the bowel treated at the operation were firmly sealed. The in-

testinal ulcers were healing. A slight degree of bronchitis was present. The mitral valve was not diseased.

In commenting on these twenty cases, I do not propose to go into the age, sex, period at which perforation took place or, in short, to compile statistics and make tables. It could readily be done, but no good purpose would be served as the number of cases is too small to allow of any accurate conclusions being drawn from such a procedure.

A few points in connection with a general survey of these cases may perhaps deserve attention and a few in relation to individual cases.

Disregarding Case 2., of which I have no full notes, in every instance with the exception of cases 3 and 10, pain was a prominent symptom of perforation. In almost all the cases it was the first symptom, and a feature in the majority was the suddenness of onset.

Tenderness was present in every case with the exception of case 19.

Rigor occurred in seven of the cases, rigidity in fourteen of them.

In every case the pulse rate was increased.

With regard to the disappearance of the liver dull-

ness, it will be seen that this was a symptom in fourteen of the cases. In case 17, it had become impaired in less than an hour. In cases 5, 10 and 20, two hours only elapsed between the first symptom of perforation and the detection of impaired liver dulness and in Case 11, only two and a half hours. In only two of the cases, namely Cases 15 and 16, of the fourteen was the appearance of this symptom delayed beyond seven hours.

In case 7, only was there a marked drop in the temperature with the initial symptoms.

Coming now to individual cases, it will be seen that in Cases 2 and 12, invagination of the gut was impracticable. In the former, an artificial anus was made and in the latter recourse was had to isolation of the perforation by means of gauze pads.

Case 4, was peculiar in the failure to discover the perforation and the finding post-mortem of typhoidal ulceration and perforation of the rectum and the sigmoid flexure. The case was clearly one of Typhoid fever and the occurrence of perforation in these parts of the bowel is exceedingly rare.

Case 5, is of interest on account of the time at which perforation took place. It occurred actually during the use of the bed pan, and it can hardly be doubted that straining efforts had some influence in

determining the rupture of the ulcer. It is also of interest on account of the length of time the child lived after operation - 8 days.

Case 6, shows a possible source of danger in loin drainage. A piece of the omentum was found protruding through one of the openings. This boy survived operation for nearly six days.

In case 7, one in which recovery took place, perforation took place 9½ hours after the giving of an enema. It is perhaps hardly fair to urge that the one was the result of the other, but it may possibly be the case.

In case 8, again, perforation occurred during the act of defoecation.

The intestine was found adhering to the anterior abdominal wall, as in a case successfully operated on and reported by Watson.[32]

Case 10. The patient suffered from a very severe attack of Enteric fever, attended by much haemorrhage, which ultimately largely contributed to, if it did not actually cause, death 5½ days after operation. The autopsy on this patient showed an interesting condition; an ulcer which had very probably perforated, had become adherent to the pelvic brim. It showed admirably how Nature may prevent the effects of perforation.

Case 11, illustrates another of Nature's efforts. In this case, an unsuccessful attempt had been made to plug a perforating ulcer with one of the appendices epiploicae.

In Case 13, the initial pain disappeared but the patient was very ill and possibly, like many of her sex did not take into account a slight pain. But it may be that the case of this woman is an exception to the rule that the pain of perforation is a lasting pain. The result of previous abdominal disease was found at operation, but it did not give rise to delay in its execution.

In case 15, perhaps the journey in the ambulance may have precipitated the perforation of an ulcer. The apex of a Meckel's diverticulum was the unusual site of the perforation.

In case 16, again, an enema was followed in three hours by perforation and again the question is raised as to whether these occurrences were cause and effect. Nature's efforts, one possibly a successful one, to seal the damaged gut, were clearly seen in this case also.

Case 17. Here perforation immediately followed an action of the bowels. Death was due to disease of the

heart and kidneys. The condition of this patient for some hours after operation was perhaps more hopeful than that of any of the others in the whole series of cases.

Case 20. Perforation in this patient, as in the case of the patient last discussed, was probably due to straining at stool.

CONCLUSION.

In the foregoing paper I have endeavoured to lay stress on the causation and symptoms of Perforation of the Bowel in Typhoid Fever, and on the diagnosis of the condition. On the actual surgical treatment I have merely touched in order to give some completeness to the subject that has been under discussion.

What I have wished to point out and what I would now, in conclusion, lay the utmost stress on is that operation in perforation of the gut in typhoid fever, when the patient is not actually moribund, should invariably be performed.

Harte and Ashhurst[33] have discovered in the whole literature of the subject, only fourteen cases where perforation has occurred and death has not resulted when there was no operative interference.

It is probable, that perforation of the caecum and appendix may result in circumscribed abscess, the general peritoneal cavity being shut off, but this happy result must indeed be rare and when the ileum is concerned almost unique.

It is not that, superficially viewed, very striking results have followed operation; it is not that very many lives have been snatched from the burning that I advocate a procedure that will at least reduce the truly terrible death roll from perforation. The mortality is still woefully heavy. Results of operation are not always encouraging, for it must be remembered that many cases of unsuccessful operation are never brought to light. But, even two lives saved, and a third, that but for an unforeseen accident, would have been saved, out of the twenty in my series, is in itself enough to show what may be done.

The physician must ever be on the look out; his part is as important and indeed as difficult as that of the surgeon, it is on the watchfulness and skill of the former that the success of the latter will in a large measure depend..

Objections to operation have been urged. Platt[34] gives a list of these objections. They are not

his own, he merely states them. They are as follows:- 1. Difficulties in diagnosis. 2. The bad condition of the patient. 3. The difficulties in finding the opening in the gut. 4. The diseased condition of the wall of the gut. 5. the occurrence of multiple perforation. 6. The presence of peritonitis. 7. The fact that some cases have recovered without operation.

I cannot see in one of these seven objections a single one that will bear the light of discussion, and I name them to dismiss them in a few words.

As to the first I would say that in a doubtful case, with increasingly grave symptoms, the abdomen should be explored. It will probably do little harm, it may do great good.

A bad condition of the patient, difficulties in locating and in dealing with the wound, the possibilities of multiple perforation and the presence of peritonitis may any, or all, appear in one case.

There are few surgeons indeed who would fear to contend with these difficulties, when there is the faintest hope of saving life.

The last objection is met by the statement that for every subject of perforation that has recovered spontaneously, tens of thousands have died.

The figures given by Taylor[35], go to show that every year in the large cities alone of the United States, 50,000 oersons die from enteric fever. He quotes from the United States Marine Hospital Service Report for 1896, in which it is estimated that 500,000 cases of enteric fever occur annually with 50,000 deaths.

Assuming that 30per cent. of the deaths arise from perforation, then no less than 15,000 persons die annually in the United States from this complication of typhoid fever and this figure does not include a single case of the thousands that must occur in rural districts.

Perforation, then, with the almost inevitable general peritonitis, that succeeds it, is accountable for an enormous number of the deaths that are caused by enteric fever, and any remedy that can be employed with the smallest possible prospect of success, should be unhesitatingly resorted to.

A comparatively new field of surgery is open. My earnest hope is that, not those merely of the first rank, but surgeons all the world over, will enter it, that the results will, as I am confident they will, become more and more encouraging and that ere long the most terribly fatal complication of typhoid fever, may have lost much of its terrors.

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